Data Assimilation and Model Evaluation Experiments - DAMEE Data

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LONG-TERM GOALS

The long term goal is to contribute to the development of a global ocean nowcasting capability with basin-wide forecasting skill that provides a description of the three dimensional ocean structure, the locations of mesoscale features such as eddies and ocean fronts, and environmental definition with an accuracy superior to climatology and persistence.

OBJECTIVES

Provide an unbiased environment in which the nowcast/forecast capabilities of numerical ocean models can be evaluated, keeping current with ongoing field experiments to assess the usefulness and possible impact of data, as it becomes available.

Focus on data acquisition, quality control, analysis and processing. Each contributing part of the desired end data product will deliver to a common point (USM) for final assemblage, analysis, and distribution.

Perform an unbiased comparison between Model output and Measured data as defined by a consensus reached in the DAMEE Information Exchange Meeting #4 for the Standard , High resolution and Data Assimilation experiments.

Execute an information management component which provides an interactive forum and coordination point for all the participating groups.

APPROACH

Five modeling groups (DIECAST, MICOM, UCLA[MOM], POM and RUTGERS) submitted model output from the coarse resolution model runs. These data were compared with climatology.

ECMWF wind stress fields for the high resolution model runs were generated (1993-1997).

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WORK COMPLETED

Five modeling groups (DIECAST, MICOM, UCLA[MOM], POM and RUTGERS) submitted model output from the coarse resolution model runs. These data were compared with climatology and/or measurements. Plots of these comparisons can be obtained from the web site:

http://www.coam.usm.edu/damee/data/Plots/

The plots are:

1. yy-27N.ps yy-55W.ps yy-CHB.ps yy-35N.ps

   Seasonal (Feb., May, Aug, Nov.) cross sections 0-1000m

   page 1: Climatology, DIE, MIC, MOM
   page 2: POM, RUT
   where:
   yy == tt Temperature
   yy == ss Salinity
   yy == rr Density
   yy == dt (Model-Climatology) of Temperature
   yy == ds (Model-Climatology) of Salinity
   yy == dr (Model-Climatology) of Density

2. xx-27N.ps xx-55W.ps xx-CHB.ps xx-35N.ps

   Annual cross sections 0-5500m

   page 1: Temperature, Salinity, Density from Climatology, DIE, MIC, MOM
   page 2: Temperature, Salinity, Density from POM, RUT
   page 3: (Model-Climatology) of Temperature, Salinity, Density
   from Climatology, DIE, MIC, MOM
   page 4: (Model-Climatology) of Temperature, Salinity, Density
   from POM, RUT

3. Gsplot

   Position of the maximum velocity of the Gulf Stream at the surface
   Comparison with SST, TOPEX and GEOSAT data

4. Fsplot

   Florida Straits Transports
   Comparison with Cable data

5. EkeMkeplot

   Eddy and mean kinetic energy at 0m, 700m and 4000m depth

page 1: Eddy kinetic energy from TOPEX data and from DIE, MIC, MOM
page 2: Eddy kinetic energy from POM, RUT
page 3: Mean kinetic energy from DIE, MIC, MOM
page 4: Mean kinetic energy from POM

6. SshSstplot

Mean and variability of Sea surface height and sea surface temperature

page 1: Mean and variability from TOPEX/MCSST and DIE, MIC, MOM
page 2: Mean and variability from POM, RUT
page 3: (Model-TOPEX/MCSST) absolute values from DIE, MIC, MOM
page 4: (Model-TOPEX/MCSST) absolute values from POM, RUT
page 5: (Model-TOPEX/MCSST) relative values from DIE, MIC, MOM
page 6: (Model-TOPEX/MCSST) relative values from POM, RUT

7. MOSplot

Meridional Overturning Streamfuncion

page 1: MIC, MOM, POM, RUT January-April
page 2: MIC, MOM, POM, RUT May-August
page 3: MIC, MOM, POM, RUT September-December
page 4: MIC, MOM, POM, RUT, DIE annual average

8. MHTplot

Meridional Heat Transport
Comparison with Macdonald-Wunsch Data

1993-1997 ECMWF wind forcing data were generated for the high resolution model runs. The original data were processed in the following stages:

1. The 6 hourly ECMWF wind stress data were interpolated from the ECMWF grid to the COADS grid.
2. At each gridpoint a monthly mean was computed for each month of the year.
3. ECMWF monthly means were replaced by COADS monthly means for all data points.
4. Monthly wind stress data files were generated.

The data are available at:

http://www.coam.usm.edu:/damee/data/Meteorology/ECMWF/Data

Filenames are of the form: ecmwfyyyy.mm
where yyyy and mm are the year and month, respectively.
These monthly global data files are binary in "big_endian" (Sun) format.

Units are in N/m**2 and there are 42164 gridpoints globally.
File "lon_lat.file" describes the grid and the ordering of the data.
column 1: order number
column 2: longitude index (as defined in the COADS dataset).
column 3: latitude index (as defined in the COADS dataset).
column 4: longitude in degrees E
column 5: latitude in degrees N
File "extract.F" is a sample fortran programs that reads one monthly
file and extracts a predefined region.

The fifth DAMEE-NAB Information Exchange Meeting (IEM\#4) was held at the Rosenstiel School of Marine and Atmospheric Sciences, University of Miami, 5 and 6 March 1998. A review of progress, data availability, and status of comparisons were presented and discussed by each group. Decision on publication was made and decided that publication of DAMEE-NAB results is an important step to successfully concluding these experiments and informing the scientific community of what was learned. It also allows for a consistent way of approaching the analysis and assessing the performance of the models. The special issue in the refereed literature is organized in the following way:

1. Introduction and motivation
2. Standard Comparisons
    - Model Climatology
        - course resolution
        - high resolution 1 and 2
    - Data Assimilation/Nowcast
3. Further analysis and assessments
    - by models (individual groups)
    - by topics (individual groups)
4. Conclusion and remarks

Reports of Information Exchange Meetings 1-4 can be found at:

http://www.coam.usm.edu/damee/index.html

RESULTS

Consistent, comprehensive, multi-parameter analysis is demonstrated and reveals the importance of temperature and salinity variations in density driven currents in models.

IMPACT/APPLICATIONS

This project is developing a comprehensive data archive of the bathymetry, wind forcing and mesoscale circulation of the North Atlantic that has been very carefully quality controlled. This data archive is a resource not only for the ocean modeling community but also for the Navy for initializing and verification of numerical ocean models.

A thorough comparison between model results and climatology reveals a wealth of information on model strengths and areas that need improvement.

TRANSITIONS

The data archive is presently available to the ocean community at the DAMEE web site. It is actively used by all DAMEE participants. An improved bathymetry and high resolution ECMWF wind stress data may enhance model performance.

RELATED PROJECTS

In addition to the DAMEE (DATA) group, participating modeling groups are from NRL/SSC, University of Miami, UCLA, Rutgers, Princeton, MIT, and Mississippi State University.

REFERENCES

The plots of the coarse resolution model outputs and their comparison with climatology are available in directory: ftp://www.coam.usm.edu/pub/damee/data/Plots